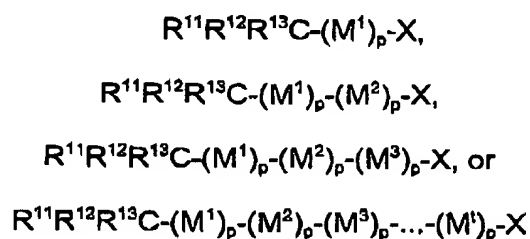


EXHIBIT A

64. A (co)polymer, exhibiting a stereochemistry and microstructure, as defined by tacticity and sequence distribution, of a polymer formed by a free radical polymerization process and displaying a molecular weight distribution of less than 2.0 and calculable number average molecular weight, having the formula:



wherein X is selected from the group consisting of Cl, Br, I, OR¹⁰, SR¹⁴, SeR¹⁴, O-N(R¹⁴)₂, S-C(=S)N(R¹⁴)₂, H, OH, N₃, NH₂, COOH and CONH₂ and groups that can be formed therefrom by conventional chemical processes, where

R¹⁰ is an alkyl of from 1 to 20 carbon atoms in which each of the hydrogen atoms may be independently replaced by halide, R¹⁴ is aryl or a straight or branched C₁-C₂₀ alkyl group, and where an N(R¹⁴)₂ group is present, the two R¹⁴ groups may be joined to form a 5- or 6-membered heterocyclic ring,

R¹¹, R¹² and R¹³ are each independently selected from the group consisting of H, halogen, C₁-C₂₀ alkyl, C₃-C₈ cycloalkyl, C(=Y)R⁵, C(=Y)NR⁶R⁷, COCl, OH, CN, C₂-C₂₀ alkenyl, C₂-C₂₀ alkynyl oxiranyl, glycidyl, aryl, heterocyclyl, aralkyl, aralkenyl, C₁-C₆ alkyl in which from 1 to all of the hydrogen atoms are replaced with halogen and C₁-C₆ alkyl substituted with from 1 to 3 substituents selected from the group consisting of C₁-C₄ alkoxy, aryl, heterocyclyl, C(=Y)R⁵, C(=Y)NR⁶R⁷, oxiranyl and glycidyl,

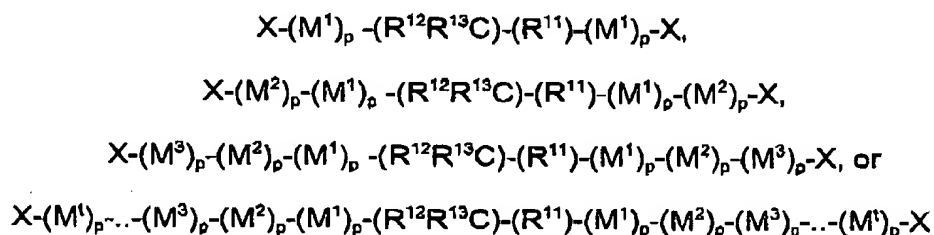
where Y is NR⁶, S or O;

where R⁵ is an aryl or an alkyl of from 1 to 20 carbon atoms, alkoxy of from 1 to 20 carbon atoms, aryloxy or heterocyclyloxy; and R⁶ and R⁷ are independently H or alkyl

of from 1 to 20 carbon atoms, or R^6 and R^7 may be joined together to form an alkylene group of from 2 to 5 carbon atoms, thus forming a 3- to 6-membered ring, such that no more than two of R^{11} , R^{12} and R^{13} are H, and R^8 is H, a straight or branched C_1 - C_{20} alkyl or aryl, and

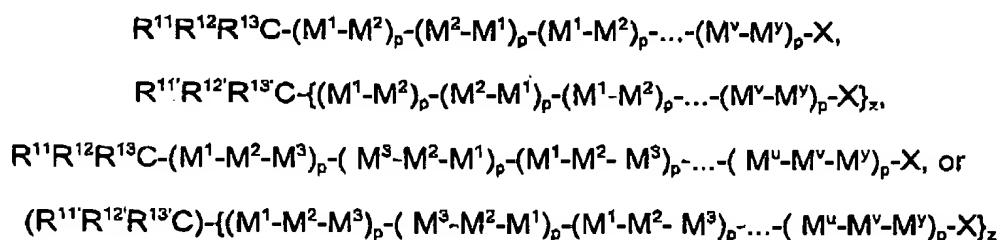
M^1 , M^2 , M^3 ,... up to M^t are each monomer units derived from radically (co)polymerizable monomer selected such that the monomers units in adjacent blocks are not identical, and t is an integer greater than 3; p for each block is independently selected such that the number average molecular weight of each block is up to 250,000 g/mol;

the following formulas:



wherein R^{11} , R^{12} , R^{13} , X , M^1 , M^2 , M^3 ,... up to M^t , t , and p are as defined above, with the proviso that R^{11} has a polymer chain as indicated attached thereto;

of the formulas:



wherein z is from 2 to 6, R^{11} , R^{12} , R^{13} and X are as defined above, and where $R^{11'}$, $R^{12'}$ and $R^{13'}$ are the same as R^{11} , R^{12} and R^{13} with the proviso that $R^{11'}$, $R^{12'}$ and $R^{13'}$ combined have from 1 to 5 of the polymer chains enclosed in brackets attached thereto and the C has only one of the polymer chains enclosed in brackets attached thereto,

M^1 , M^2 and M^3 are monomer units derived from different radically-(co)polymerizable monomers, and M^u is one of M^1 or M^2 or M^3 and M^v is another of M^1 or M^2 or M^3 , and M^w is the third (co)monomer,

p for each block is independently selected such that the number average molecular weight of the copolymer is up to 1,000,000 g/mol; and,

(co)polymers of this topology comprising four or more comonomers, and of the formulas:

$$\begin{aligned} & (R^{11'}R^{12'}R^{13'}C)-\{(M^1)_p-X\}_z, \\ & (R^{11'}R^{12'}R^{13'}C)-\{(M^1)_p-(M^2)_p-X\}_z, \\ & (R^{11'}R^{12'}R^{13'}C)-\{(M^1)_p-(M^2)_p-(M^3)_p-X\}_z, \text{ or} \\ & (R^{11'}R^{12'}R^{13'}C)-\{(M^1)_p-(M^2)_p-(M^3)_p-\dots-(M^l)_p-X\}_z \end{aligned}$$

wherein z is from 3 to 6; $R^{11'}$, $R^{12'}$ and $R^{13'}$ are the same as R^{11} , R^{12} and R^{13} with the proviso that $R^{11'}$, $R^{12'}$ and $R^{13'}$ combined contain from 2 to 5 of the polymer chains enclosed in brackets attached thereto and the C has only one of the polymer chains enclosed in square brackets attached thereto, where X is as defined above;

M^1 , M^2 , M^3 , ... M^l , p , and t are as defined above; and

and copolymers comprising a block or graft with the above composition; and

of the formula:

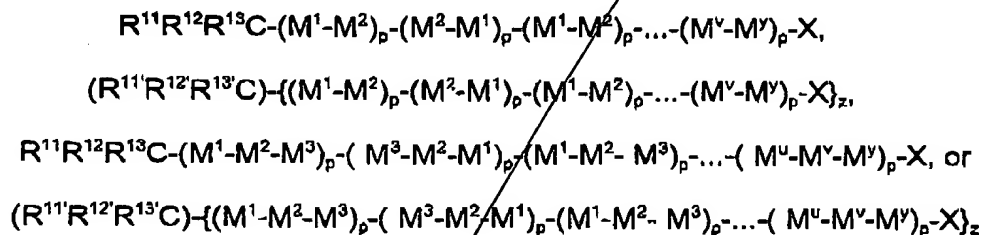
$$\begin{aligned} & R^{11'}R^{12'}R^{13'}C-(M^1_sM^2_b)-(M^1_cM^2_d)-(M^1_eM^2_f)-\dots-(M^1_gM^2_h)-(M^1_iM^2_j)-X, \text{ or} \\ & R^{11'}R^{12'}R^{13'}C-\{(M^1_sM^2_b)-(M^1_cM^2_d)-(M^1_eM^2_f)-\dots-(M^1_gM^2_h)-(M^1_iM^2_j)-X\}_z \end{aligned}$$

where z is from 2 to 6, R^{11} , R^{12} , R^{13} are as defined above, M^1 and M^2 are as defined above and where $R^{11'}$, $R^{12'}$ and $R^{13'}$ are the same as R^{11} , R^{12} and R^{13} with the proviso that $R^{11'}$, $R^{12'}$ and $R^{13'}$ combined have from 1 to 5 of the polymer chains enclosed in brackets attached thereto and the C has only one of the polymer chains enclosed in square brackets attached thereto, and

a , b , c , d , e , f , ... up to i and j are non-negative numbers independently selected such that

$a + b = c + d = 100$, and any or all of $(e + f)$, $(g + h)$ and $(i + j) = 100$ or 0, wherein the $a:b$ ratio is from 100:0 to 0:100, the $c:d$ ratio is from 95:5 to 5:95, such that $c < a$ and $d > b$, and where applicable, the $e:f$ ratio is from 90:10 to 10:90, such that $e < c$ and $f > d$, and the endpoints of the molar ratio ranges of first monomer to second monomer in successive blocks progressively decrease or increase by 5 such that the $e:f$ ratio is from 5:95 to 95:5, such that $e \neq c$ and $f \neq d$, and the $i:j$ ratio is from 0:100 to 100:0, such that $i \neq e$ and $j \neq f$.

13 65. (Amended) The (co)polymer of Claim 64, having a formula:



wherein z is 2 to 6;

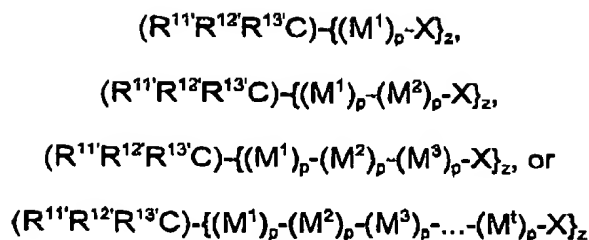
wherein R^{11} , R^{12} , R^{13} and X are as previously defined, and where $R^{11'}$, $R^{12'}$ and $R^{13'}$ are the same as R^{11} , R^{12} and R^{13} , with the proviso that $R^{11'}$, $R^{12'}$ and $R^{13'}$ combined have from 1 to 5 of the polymer chains enclosed in brackets attached thereto and the C has only one of the polymer chains enclosed in brackets attached thereto;

M^1 , M^2 and M^3 are monomer units derived from different radically-polymerizable or copolymerizable monomers, and M^u is one of M^1 , M^2 or M^3 and M^v is another of M^1 , M^2 or M^3 , and M^y is the third (co)monomer,

p for each block is independently selected such that the number average molecular weight of the copolymer is from 1,000 to 1,000,000 g/mol; and (co)polymers of this topology comprising four or more comonomers

17 66. The (co)polymer of Claim 64, having a formula:

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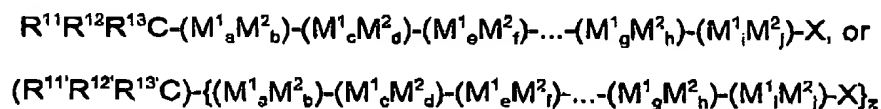


where $R^{11'}$, $R^{12'}$ and $R^{13'}$ are the same as R^{11} , R^{12} and R^{13} as previously defined, with the proviso that $R^{11'}$, $R^{12'}$ and $R^{13'}$ combined contain from 2 to 5 of the polymer chains enclosed in brackets attached thereto and the C has only one of the polymer chains enclosed in brackets attached thereto, where X is as defined above;

M^1 , M^2 , M^3 , ..., M^t , p and t are as defined above,

z is from 3 to 6, and copolymers comprising a block or graft with the above composition.

¹⁹
~~67.~~ The (co)polymer of Claim ¹⁷~~64~~, having the formulae:



where R^{11} , R^{12} , R^{13} , and X are as previously defined, and where $R^{11'}$, $R^{12'}$ and $R^{13'}$ are the same as R^{11} , R^{12} and R^{13} with the proviso that $R^{11'}$, $R^{12'}$ and $R^{13'}$ combined have from 1 to 5 of the polymer chains enclosed in square brackets attached thereto and the C has only one of the polymer chains enclosed in square brackets attached thereto,

M^1 and M^2 are monomer units derived from different radically (co)polymerizable monomers, and a, b, c, d, e, f, ..., up to i and j are non-negative numbers independently selected such that $a + b = c + d = 100$, and any or all of $(e + f)$, $(g + h)$ and $(i + j) = 100$ or 0, wherein the

a:b ratio is from 100:0 to 0:100, the c:d ratio is from 95:5 to 5:95, such that $c < a$ and $d > b$, and where $e \neq 0$ and $f \neq 0$, the e:f ratio is from 90:10 to 10:90, such that $e < c$ and $f > d$, and the endpoints of the molar ratio ranges of first monomer to second monomer in successive blocks progressively decrease or increase by 5 such that the e:f ratio is from 5:95 to 95:5, such that $e \neq c$ and $f \neq d$, and the i:j ratio is from 0:100 to 100:0, such that $i \neq e$ and $j \neq f$, and z is from 2 to 6.